

2.1.5.5 Water

Potable water would be required for drinking, washing, toilets, contaminated clothing laundering, and other uses and would be purchased from the City of Moab. Nonpotable or construction water would be required for dust control, earth compaction, equipment decontamination, and other uses and would be derived from DOE's Colorado River water rights. DOE estimates that the total potable water requirement for the on-site disposal alternative would be 4,200 gallons per day, or approximately 30 gallons per day per worker. DOE estimates that the average annual nonpotable water requirement would be 70 acre-feet, or a project total of approximately 490 acre-feet assuming a 7-year project duration.

2.1.5.6 Solid Waste Disposal

The on-site disposal alternative would generate approximately 1,040 yd³ of uncontaminated solid waste per year. The solid waste would be disposed of in the Grand County landfill.

2.1.5.7 Sanitary Waste Disposal

DOE estimates that the on-site disposal alternative would result in the generation of approximately 10,000 gallons of sanitary waste per week, or approximately 1,430 gallons per day, assuming a 12-hour shift. Septic holding tanks connected to bathrooms in the trailers would be placed at the Moab site along with portable toilets used to provide sanitary waste service. Both the septic tanks and the portable toilets would be pumped out routinely and disposed of at the city of Moab sewage treatment plant.

2.1.5.8 Electric Power

DOE estimates that under the on-site disposal alternative, the existing electrical service at the Moab site would be required to support an estimated maximum demand of 600 kilovolt-amperes (kVA). The primary demands for this power would be:

- Conversion of the mill building to a vehicle/equipment maintenance shop.
- Field office trailers.
- Office and parking lot security lighting.
- River pump station.
- Decontamination water sprays and recycle pumps.

2.2 Off-Site Disposal Alternative

The off-site disposal alternative would entail excavating and relocating the entire Moab site tailings pile, other contaminated on-site material, and all contaminated material from vicinity properties to one of three alternative off-site disposal cells that would be constructed specifically as a permanent repository for these materials. The three proposed off-site disposal alternatives DOE is evaluating are Klondike Flats and Crescent Junction, which are north of the Moab site, and the White Mesa Mill site to the south. [Figure 2-9](#) shows the Moab site and the three potential disposal sites. DOE is also evaluating three alternative modes of transportation to move

the material to the off-site disposal cell: truck, rail, and slurry pipeline; however, as described further in Section 2.5.2, rail transport is not an option for the White Mesa Mill site. Contaminated material from vicinity properties would first be moved to the Moab site, then transported to the off-site disposal location. Contaminated ground water at the Moab site would also be remediated under the off-site disposal alternative as described in Section 2.3.

The major actions associated with implementing the off-site disposal alternative would be:

- Construction and operations at the Moab site (Section 2.2.1).
- Characterization and remediation of vicinity properties (Section 2.2.2).
- Construction and operations at the borrow areas (Section 2.2.3).
- Transportation of contaminated material from the Moab site to the off-site disposal location (Section 2.2.4).
- Construction and operations at the off-site disposal location (Section 2.2.5).
- Monitoring and maintenance of the off-site disposal cell (Section 2.2.6).
- Ground water remediation at the Moab site (Section 2.3).

Resource requirements for remediation activities are discussed in Section 2.2.7.

For the off-site disposal alternative, where pile consolidation time is not a factor, project completion dates under the truck and rail transportation options could be affected by work schedules. Consequently, for these two modes of transportation, DOE considered two work schedules. The single-shift schedule would be one 12-hour shift, 7:00 a.m. to 7:30 p.m., 50 weeks per year. The double-shift schedule would be two 10-hour shifts, 7:00 a.m. to 5:30 p.m. and 5:30 p.m. to 4:00 a.m., 50 weeks per year. These two schedules were considered to allow flexibility in targeting a project completion date. In this EIS, impacts are generally assessed assuming the more aggressive double-shift schedule is implemented. This was done to ensure that certain impacts unique to the double-shift were addressed. For example, night operations under a double shift could entail impacts to night sky vision, noise, and traffic that would not be considerations under a single-shift scenario. The NPS has expressed concern for these factors in relation to Arches National Park. The one difference in these schedules would be that for truck transportation the schedules would run 7 days per week, and for rail transportation the schedules would run only 6 days per week. This difference would be necessary to accommodate railroad requirements that stipulate 1 day per week be allowed for locomotive and track maintenance.

DOE considered only one schedule for the pipeline transportation option because once pumping operations began they would be in progress 24 hours a day. Processed slurry would be stockpiled, and the factor driving the schedule for project completion would be the diameter of the pipe rather than the number of workers excavating the pile. DOE selected the pipe diameter to allow for a schedule roughly the same as the rail and truck transportation single-shift work schedule that estimates project completion in 2012.

Figure 2–10, Figure 2–11, and Figure 2–12 illustrate the estimated schedules for completing the surface remediation activities for the off-site disposal alternative using the three transportation modes. As seen in the figures, the schedules would be similar for all three modes of

transportation. Assuming that a ROD is issued in 2005 and that a single-shift work schedule is implemented for truck or rail transportation, remediation work would begin in late 2007 and would be completed in 2012 for all three modes of transportation, regardless of the off-site disposal cell location. Due to uncertainties in tailings material handling and transportation, the project completion date could extend to 2014. This is based on information developed since the draft EIS. Extending the schedule by two years to 2014 would not result in additional impacts to human health or the environment. This is similar to the schedule that would apply for the on-site disposal alternative if the more aggressive 1-year top slope cover construction schedule were used (see Figure 2–4). However, as shown in Figure 2–10 and Figure 2–11, use of a more aggressive double-shift work schedule for the truck or rail transportation modes would expedite completion of the surface remediation activities by approximately 2 years and result in completion of the surface remediation activities in late 2010 or early 2011. The 2-year schedule uncertainty for pile consolidation discussed in Section 2.1 for the on-site disposal alternative would not apply for the off-site disposal alternative.

2.2.1 Construction and Operations at the Moab Site

This section describes construction and operations at the Moab site under the off-site disposal alternative. Ground water remediation at the Moab site is discussed in Section 2.3. The following subsections address three elements: (1) site preparation, infrastructure enhancement, and control, (2) excavation and processing of tailings and other contaminated material, and (3) Moab site reclamation. Figure 2–13 is a Moab site plan illustrating the major site features and approximate locations of temporary on-site areas and facilities that would be used under the off-site disposal alternative.

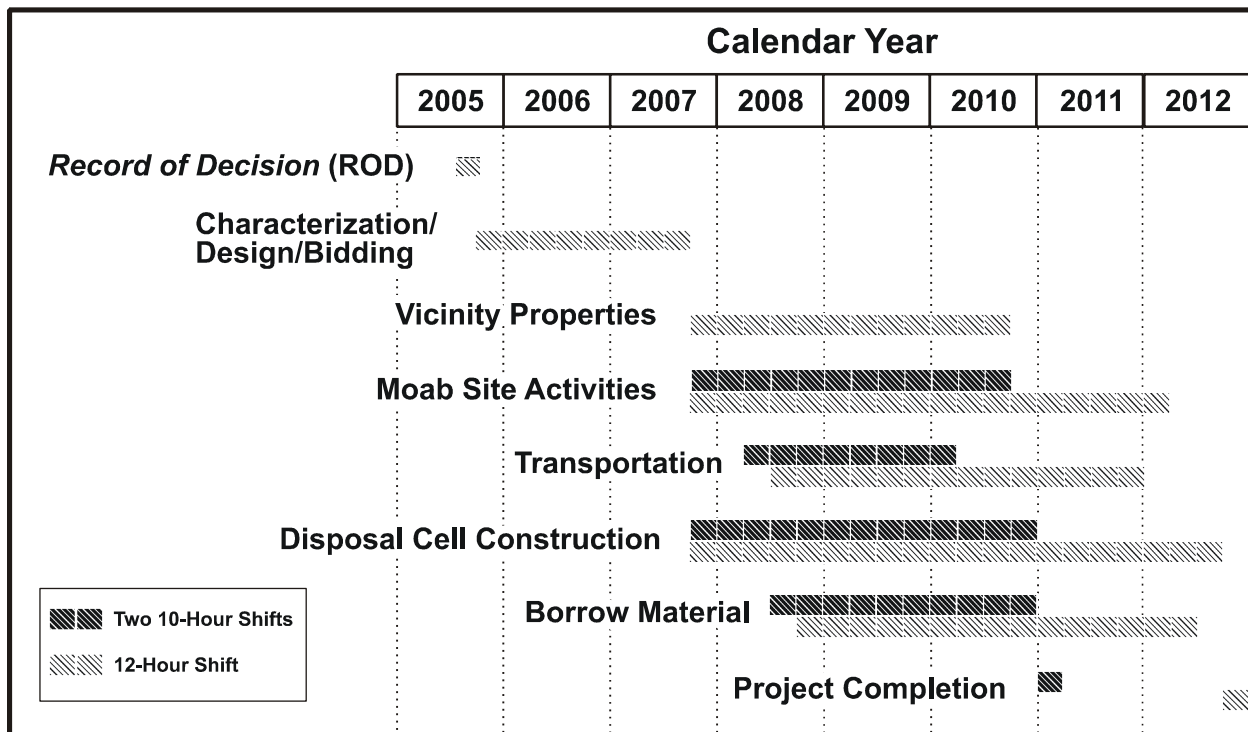


Figure 2–10. Truck Haul Off-Site Disposal Alternative, Surface Remediation Activity Schedule

2.2.1.1 Site Preparation, Infrastructure Enhancement, and Controls

Many aspects of the Moab site preparation, infrastructure enhancement, and controls would be similar to those described in Section 2.1.1.1 for the on-site disposal alternative. The major differences would be associated with the temporary transportation infrastructure, access roads, and vicinity property material storage that would be required for the off-site disposal alternative. As with the on-site disposal alternative, in all instances, new structures or other installed elements would be painted a color to match background soils and/or vegetation in order to minimize visual impacts seen from US-191 or SR-279.

Activities that would be similar or identical to those described in Section 2.1.1.1 include

- Storm water management.
- Dust control.
- Water pumping station enhancements.
- Temporary field offices and staging areas.
- Vehicle maintenance and fuel storage areas.

Temporary Transportation Facilities

Temporary facilities would be necessary to support whichever transportation mode was selected. If the truck option were selected, highway access consisting of an overpass and acceleration and deceleration lanes would be required. If the rail option were selected, a railroad spur and a conveyor system to convey tailings to the railroad cars would be required. If the slurry pipeline option were selected, a pumping station with associated material preparation items would be required. More detailed descriptions of the required temporary transportation facilities that would be constructed at the Moab site are included in Section 2.2.4.

New Access Roads

The existing access road to the Moab site is adequate for only a limited volume of traffic. Construction of approximately 1,000 ft of new access roads to accommodate the added volume of traffic would be required for the off-site disposal alternative. New access roads would be 30 ft wide and gravel-surfaced; therefore, they would not require regular dust control measures. Section 2.2.4 describes the required new or upgraded access roads in greater detail.

Vicinity Property Storage Area

Vicinity property remediation is discussed in Section 2.1.2. Prior to being transported for final disposal, contaminated materials from vicinity properties would be delivered to the Moab site for sizing and processing. These materials would be stored in a vicinity property storage area until ready for processing or transportation.

Radiological Controls

The radiological controls at the Moab site would be structurally and functionally similar to those described in Section 2.1.1.1. One modular trailer would control personnel access to contamination areas. For the truck transportation option, two vehicle/equipment decontamination

stations would be constructed: one for vicinity property haul trucks, and a larger one with three to four bays for decontaminating tailings haul trucks. The final size and layout of the facility would reflect the expected volume of truck traffic. For the rail or pipeline options, a single vehicle/equipment decontamination facility would be constructed.

2.2.1.2 Excavation and Preparation of Tailings for Transportation

This section describes the actions that would be necessary at the Moab site to prepare, excavate, and process contaminated material for transportation to an off-site location. This discussion addresses activities up to the time when contaminated materials are loaded into trucks for highway transportation (truck haul transportation alternative) or into the conveyor hopper (rail transportation alternative). The material preparations for truck or rail transport would differ from those for slurry pipeline transport.

Preparation for Truck and Rail Transportation

Before it could be transported by truck or rail, the material in the tailings pile would have to be excavated and dried to a specified moisture content by drying in a process bed and mixing with drier material. For the purposes of this EIS, this drying process has been assumed to bound potential impacts such as air emissions to workers and the public. Approximately 32 acres at the northwest and east base of the pile and an additional 14 acres around the top perimeter of the pile would be used as drying or processing areas. These areas (see Figure 2-13) would be accessed by temporary haul roads. There would be approximately seven separate 6- to 7-acre process beds in the areas. The system would be designed to control a reference 100-year storm event throughout the construction period and would include new or improved berms around the drying beds, drainage ditches and basins, hay bales, sediment traps, and silt fence fabric. DOE has previous experience successfully moving wet tailings, including saturated slimes, at other UMTRCA sites such as at the Riverton (Wyoming), Rifle (Colorado), Monument Valley (Arizona), and Grand Junction (Colorado) sites. The actual method of drying would be developed as part of the engineering design after the ROD and would include controls to prevent contamination of the soils and ground water. Conventional engineering solutions, including a liner for the drying bed or a mechanical system such as a press or centrifuge, would be considered.

Once the process beds and haul roads were constructed, pile excavation would begin. An excavating machine located on the perimeter of the pile would excavate from the center of the pile outward. The excavating machine would drag slimes from the center and pull them over and into the perimeter sands, providing some mixing during the excavation. The coarser tailings sands at the outer perimeter of the pile would be excavated and moved to the process beds using scrapers. This method would allow a progressive top-down excavation sequence that would maintain the stability of the perimeter tailings dike surrounding slimes and also allow continuous use of the perimeter area material for processing.

As saturated slimes were excavated from the center of the pile, the material would be loaded onto trucks and taken to the process beds for mixing and drying. A tractor would turn and dry the graded material until it reached a consistent moisture content suitable for truck or rail transport. Assuming dry tailings were available for mixing with wet tailings, the mixing and drying process for a load of excavated material would take approximately 3 days; if dry tailings were not available for mixing, the material would be processed for 7 days prior to shipment. The approximate maximum daily volume of material that could be placed for processing would be

15,500 yd³ in each process bed of approximately 6 to 7 acres. Should tailings drying take additional time, slightly greater areas for drying would be necessary to allow sufficient inventory of tailings to be dried and transported according to the planned schedule.

Once the material was sufficiently dry, it would be loaded onto 22-ton tandem trucks (total 44 tons) for off-site shipment if the truck transportation mode were implemented. Alternatively, if rail transport were implemented, the dried material would be transported by a conveyor system and loaded onto waiting gondola cars. After excavation of the pile reached the assumed original grade, it would continue until the cleanup criterion had been met. On the basis of limited existing data, DOE estimates that subpile excavation to a depth of 2 ft would be required.

Preparation for Slurry Pipeline Transportation

Although pile excavation for the slurry pipeline transportation alternative would occur in the same manner as for truck or rail transportation, post-excavation processing would be different because the pipeline mode of transportation would require that the materials be mixed with significant amounts of water to form a slurry. As tailings were excavated, off-highway haul trucks would be loaded at the point of excavation and would deliver the material to a temporary stockpile near the slurry processing area. The material would be screened to separate greater-than-4-inch material from less-than-4-inch material. The larger material, or debris, would be stockpiled for highway truck haul to the disposal cell. Loaders would then deliver the smaller material to slurry process hoppers. Section 2.2.4.3 discusses the slurry pipeline transportation process.

Demolition and Disposal of Existing Mill Facilities

The existing mill facilities would be demolished and disposed of in a manner similar to that described in Section 2.1.1.2, with the exception that demolished material would be stockpiled, sized, and transported to the selected off-site disposal cell rather than deposited in the on-site disposal cell for permanent disposal. For the slurry pipeline and rail transportation alternatives, the demolished materials would be transported by truck.

2.2.1.3 Moab Site Closure

Site reclamation actions would be similar to those described under the on-site disposal alternative (Section 2.1.1.4). However, an additional 130 acres of reclamation would be required at the Moab site under this alternative due to removal of the tailings pile. Potential future uses of the site would be a more significant factor in determining final reclamation actions for the off-site disposal alternative because the pile would be removed. Once all contaminated material was removed from the Moab site, closure would begin and would involve two phases: (1) removal of temporary facilities, and (2) final site reclamation.

Removal of Temporary Construction Facilities

The temporary facilities described under Section 2.2.1.1, as well as concrete slabs, piping, sewage holding tanks, and pond liners, would be removed from the site in accordance with a waste management plan that complied with all applicable federal and state regulations. Wherever possible, materials would be salvaged for reuse at other sites. Unsalvageable materials would be disposed of in the off-site disposal cell, at another licensed facility, or as municipal waste, as appropriate.

Final Site Reclamation

As discussed in Section 1.4.5, release of portions of the site for future uses would depend on the success of site remediation. DOE's ultimate goal would be to remediate to unrestricted surface use standards. However, DOE would defer its decisions on the release and future use of the Moab site pending an evaluation of the success of surface and ground water remediation. Some fencing would be required at least for the 75 years during which ground water remediation would be ongoing. Before backfill and site reclamation and following the removal of the temporary infrastructure, structures, and controls, DOE's contractor would verify that radium-226 concentrations in soil within the Moab site boundary did not exceed EPA standards in 40 CFR 192. The entire site would then be graded and recontoured. The water storage ponds would be backfilled to original grades prior to reclamation. Approximately 425,000 yd³ of fine-grained silty- to sandy-loam reclamation soil excavated from the Floy Wash borrow area would be imported as backfill for the Moab site. Soils would be prepared for planting by scarifying with a disk harrow. Moisture conditioning would be performed and the area seeded with native or adapted plant species.

Moab Wash would be reconstructed in its general present alignment. After removal of the tailings impoundment and contaminated soils, site topography and future land use are uncertain. Thus, to minimize costs and achieve fluvial stability, the channel would be reestablished in its current location. Additional meanders may be added to increase travel distance of the water and reduce slope to mitigate future erosion caused by higher water flow velocity. The channel would be lined with riprap and designed to carry the estimated runoff volume for a 200-year flood. Larger flows would be allowed to flood into channel overbank areas.

2.2.2 Characterization and Remediation of Vicinity Properties

Characterization and remediation of vicinity properties would be completed as described in Section 2.1.2. The primary difference between the on-site and off-site disposal alternatives with regard to vicinity properties would be the requirement to transport the stockpiled material to an off-site disposal location.

2.2.3 Construction and Operations at Borrow Areas

Descriptions of borrow material site locations, standards, and excavation procedures are the same as those described in Section 2.1.3. However, borrow material traffic density and routing would differ from those described in Section 2.1.3.2 because, with the exception of the Moab site reclamation soil, the borrow materials would be delivered to, or be available at, the selected off-site disposal location.

Transport Truck Traffic Density

As shown in [Table 2–7](#), assuming implementation of a double work shift (for truck or rail haul) DOE estimates that the transport of borrow materials would require a total of 67 daily round-trips for the Klondike Flats off-site disposal alternative and 24 for the Crescent Junction or the White Mesa Mill alternative. (For the slurry pipeline mode, average daily round-trips would be about 30 percent less than those shown in Table 2–7 because of the longer overall schedule for borrow material activities.) Under a double work shift schedule, borrow material transportation would be ongoing for approximately 2.75 years (875 days) for the truck or rail transportation mode (see Figure 2–10 and Figure 2–11). For the slurry pipeline mode, borrow material activities

would be ongoing for about 4 years (Figure 2–12). Table 2–7 also shows the total volume and total shipments for each of the five types of borrow materials.

If a single daily work shift schedule were implemented for the truck or rail transportation modes, borrow material transportation would be ongoing for approximately 3.75 years, and the estimated daily round-trips would decrease to approximately two-thirds of the numbers shown in Table 2–7. As shown in Table 2–1, there are several optional borrow areas for obtaining cover soil. Table 2–7 assumes that all cover soil would come from the Floy Wash borrow area (as would all Moab site reclamation soil). This option would generate the most traffic on public highways.

Table 2–7. Summary Logistics for Borrow Material Transport
(Truck or Rail Haul Double Work Shift)

Borrow Material	Klondike Flats Alternative			Crescent Junction Alternative			White Mesa Mill Alternative		
	Daily Round-Trips	Total Volume (yd³)	Total Ship.	Daily Round-Trips	Total Volume (yd³)	Total Ship.	Daily Round-Trips	Total Volume (yd³)	Total Ship.
Cover soils	43	1,243,000	37,800	NA ^a	1,243,000	NA ^a	NA ^a	1,243,000	NA ^a
Radon barrier soils	NA ^a	294,000	NA ^a	NA ^a	294,000	NA ^a	NA ^a	294,000	NA ^a
Sand and gravel	7	215,750	6,538	7	215,750	6,300	7	215,750	6,300
Riprap	2	43,400	1,973	2	43,400	1,973	2	43,400	1,973
Moab reclam. soils	15	424,867	12,875	15	424,867	12,875	15	424,867	12,875
Total	67	2,221,017	59,186	24	2,221,017	21,148	24	2,221,017	21,148

^aMaterial available at off-site disposal location.

2.2.4 Transportation of Tailings Pile and Other Contaminated Material

DOE evaluated the truck and pipeline modes of transportation for all three potential sites. Rail service was determined not feasible for the White Mesa Mill site because no rail service is available; therefore, this mode was evaluated only for the Klondike Flats and Crescent Junction sites. Table 2–8 shows the estimated source material quantities that would be transported under the off-site disposal alternative. On the basis of recent surveys that were not available at the time the draft EIS was developed, DOE has slightly increased its estimate of the volume of contaminated off-pile soil that would be disposed of with the tailings. The increase is less than 1 percent of the total estimated volume of contaminated site material. The revised total estimates remain approximate and could increase again after more detailed site characterization is complete. The estimated volumes presented in the draft EIS represented DOE’s best estimate based on information available when the draft EIS was developed. Due to the small cumulative change, the draft EIS estimates have been retained as a constant in the final EIS for purposes of assessing and comparing the impacts of each alternative. DOE would use the most current and reliable estimates of the volumes of all contaminated site material in developing the remedial action plan.

Table 2–8. Source Material Quantities

Source Material	Volume (yd ³)	Weight (dry short tons)
Uranium mill tailings	7,800,000	10,500,000
Pile surcharge	445,000	600,000
Subpile soil	420,000	566,000
Off-pile contaminated site soils	173,000	234,000
Vicinity property material	29,400	39,700
Total	8,867,400	11,939,700

Figure 2–14 shows the Moab site and the proposed truck and rail routes. The proposed slurry pipeline routes are shown in Figure 2–15, and detailed maps are presented in Appendix C.

2.2.4.1 Truck Transportation

DOE analyzed highway truck transportation for all three alternative sites and two work shift scenarios. Existing highways would be used with some improvements made. In 2004, the Utah Department of Transportation (UDOT) completed the widening of US-191 to a four-lane highway from the Moab site north to SR-313. The truck fleet size would vary depending on the disposal site location. An independent trucking company using its own fleet of trucks would do the trucking.

Summary Tabulation of Truck Transportation Logistics

Table 2–9 summarizes logistics information for truck transportation from the Moab site to the three alternative off-site disposal locations.

Table 2–9. Summary Logistics for Truck Transportation from the Moab Site to Three Alternative Off-Site Disposal Locations

	Miles One-Way from the Moab Site to Alternative Disposal Cells					
	Crescent Junction		Klondike Flats		White Mesa Mill	
On highways	28		14		84	
On access roads	2		4		1	
Total miles	30		18		85	
Miles through community	0.5		0		9.5 ^a	
	Truck Production Estimates for Alternative Disposal Cells					
	Crescent Junction		Klondike Flats		White Mesa Mill	
	1 shift	2 shifts	1 shift	2 shifts	1 shift	2 shifts
Daily round-trips	219	384	219	384	219	384
Trucks per fleet	36	37	24	26	78	82
Years to complete	3.5	2.0	3.5	2.0	3.5	2.0
Round-Trip Cycle Times (hours) ^p						
Crescent Junction	1.9					
Klondike Flats	1.3					
White Mesa Mill	4.2					

^aRoute to White Mesa Mill site traverses 2 miles through Monticello, 4 miles through Blanding, and 3.5 miles through Moab.

^bCycle times would depend primarily on the round-trip distance. However, other factors considered include highway grades, traveling through communities, nonhighway haul roads, and material handling activities such as loading, unloading, and decontamination.

Permits and Exemptions

The proposed 22-ton tandem trailer, hauling a total of 44 tons per truck, would require a special highway permit from UDOT. All work within UDOT rights-of-way would require an encroachment permit from UDOT Region 4. In addition, other federal, Utah, and local requirements would apply. As at other UMTRCA sites, DOE would apply for a DOT exemption to ship uranium mill tailings (see text box titled “DOT Exemption”). Regardless of the exemption, DOT would require that each truck be surveyed for radioactivity prior to release from the site and that truck beds be covered to mitigate spills and prevent windblown contamination during transport. No loose radioactivity would be present on the outside of the truck. All transportation would be conducted under a transportation plan that included emergency provisions, manifesting, and specific information regarding any RCRA- or TSCA-regulated material, if applicable.

DOT Exemption

A DOT exemption, similar to that obtained for the DOE UMTRA and Monticello Projects, would allow exemption from specific DOT regulations, including

- 49 CFR 171.15 and 171.16.
- 49 CFR 172.202, .203(c)(1), .203(d), .302(a) and (b), .310, .331, .332, and Part 172 Subpart E and F (labeling and placarding).
- 49 CFR 173.22(a)(1), 173.403 only as it relates to the definition of closed transport vehicles, .427(a)(6) except for requirements stated in this exemption, .443(a).
- 49 CFR 177.817, and .843(a).

These exemptions would allow relief from certain transportation regulations pertaining to uranium and thorium mill tailings, soils, and other materials contaminated with radionuclides from uranium and thorium at the Moab site and vicinity properties. Some of the relief includes the use of closed vehicles and bulk containers without detailed analysis of the contents and with alternative requirements for hazard communication information and packaging. In addition, manifesting each truckload of tailings would not be required under the exemption, nor would labeling of contents or placarding of the truck. As long as the vehicles were protected by tarps or other means to prevent releases, they would not need to be monitored for each trip. A dedicated radioactive materials use statement would be required on the truck, and would have to be removed before the truck was thoroughly decontaminated and released according to DOE standards to haul any other material. A copy of the exemption would have to be carried in the cab of each truck hauling material under the exemption. Emergency reporting requirements are limited to DOE management when more than 1,500 pounds of material is spilled, and the information typically contained in a transportation plan is incorporated as part of the exemption document.

Load, Haul, and Dump Operations

After the tailings were processed and dried to the necessary moisture levels (see Section 2.2.1.2), the transport trucks would be loaded and the truck beds covered with tarps by an automatic tarping device. After the trucks were loaded, the exterior of the trucks would be decontaminated. The trucks would then be scanned for radioactivity and, if clean, released for highway transportation. At the disposal site, the trucks would drive directly into the disposal cell on dedicated haul roads and dump the tailings at designated locations in the cell for spreading, moisture conditioning as needed, and compaction. [Figure 2–16](#) illustrates a typical disposal cell area, haul roads, and other major features.

After dumping, the haul trucks would be decontaminated, scanned for radioactivity, and released prior to leaving the disposal site. As shown in [Figure 2–16](#), the disposal site would include a

truck maintenance and fuel storage area. This area would also serve as a parking yard to store one-half of the truck fleet during the off-shift and to park any backup trucks. The other half of the fleet would be stored during the off-shift at the Moab site. An office trailer would also be located at the site to support administration for the trucking service. Fuel storage tanks would range from 5,000 to 20,000 gallons, depending on the disposal cell location, and would have spill containment berms constructed around them.

Truck Maintenance and Storage Facilities at the Disposal Sites and the Moab Site

The following sections describe the transportation-related infrastructure that would be constructed and eventually reclaimed at the Moab site and the three alternative off-site disposal locations.

Moab Site Truck Transportation Infrastructure Construction and Reclamation

Figure 2–17 shows the Moab site and anticipated temporary construction infrastructure that would be required to support a truck haul. New highway access, overpass, and acceleration/deceleration lanes would be constructed for the north haul to Klondike Flats or Crescent Junction or south haul to White Mesa Mill. A new site entrance on US-191 would be built approximately halfway between the existing site entrance and Potash Road (SR-279) on the north side of the Moab site. As seen in Figure 2–17, the proposed new truck transportation infrastructure would be located within the Moab site boundary and therefore would not constitute additional land disturbance beyond the 439-acre site area assumed to be disturbed during surface remediation.

The improvements would all be temporary and would be used only for the life of the tailings haul. Design and construction criteria would meet American Association of State Highway and Transportation Officials (AASHTO) and UDOT standards, with the design life a consideration. At the end of the tailings haulage, the acceleration/deceleration lanes and overpass would be removed and reclaimed. The current US-191 access would be reestablished as the site access.

Klondike Flats Site Truck Transportation Infrastructure Construction and Reclamation

A new overpass across US-191 with a deceleration lane entering it would be constructed for north-bound trucks to access Blue Hills Road and avoid crossing the south-bound lane. The overpass would replace the existing Blue Hills Road turnoff (Figure 2–18). (Note: In Figure 2–18 and other similar figures, the insert showing a typical cell indicates comparative size only. The final location of the cell would be within the larger hatched site area and would be decided after further investigation of surface and subsurface geologic and hydrologic conditions; investigations could also include site-specific cultural or archeological surveys or other sampling.) The existing Blue Hills Road would be paved from US-191 for approximately 2 miles to the tailings pile access exit. The haul road would continue north through the bluffs and into the disposal cell area. The exact configuration of the haul road would depend on where the disposal cell was located within the Klondike Flats site.

The haul road from the highway overpass to the disposal cell would be a private road for truck traffic and cell access only. A new Blue Hills Road access for public use would be constructed south of and parallel to the existing Blue Hills Road for 2 miles. It would reconnect to the existing Blue Hills Road west of where the new haul road would turn north. Access to the new

public access Blue Hills Road would be through a new intersection with US-191 south of where the newly constructed private acceleration lane ended. The new Blue Hills Road access would be constructed to the same size and surface condition as the existing Blue Hills Road.

The acceleration lanes, deceleration lanes, and overpass would all be temporary structures to be used only for the life of the tailings haul. Design and construction criteria would meet AASHTO and UDOT standards with the design life a consideration.

At the end of the tailings haulage, the acceleration/deceleration lanes and overpass would be removed and reclaimed. The 2 miles of haul road that is currently the Blue Hills Road would remain paved, and the existing intersection with US-191 would be reconstructed, reestablishing Blue Hills Road to its former public use. The newly constructed Blue Hills Road would be regraded and reclaimed. The new haul road from the existing Blue Hills Road to the disposal cell would remain in place to provide future cell access for inspections.

Crescent Junction Site Truck Transportation Infrastructure Construction and Reclamation

The transportation trucks would use existing US-191 to transport the tailings from the Moab site to the Crescent Junction site. Road improvements would be made from the I-70 overpass to the south side of the Union Pacific rail line (Figure 2–19). A haul road would be constructed parallel to the rail line going east approximately 1 mile, where it would turn north across the railroad tracks and continue to the disposal cell. The exact configuration of the haul road would depend on where the disposal cell was located within the Crescent Junction site.

CR-175, which is the old US-50, lies north of I-70. It parallels the Union Pacific rail line and intersects US-191 north of I-70. The county road is currently paved but would have an asphalt overlay placed on it from US-191 for approximately 1,000 ft to the east. At that point, a new haul road would be constructed north on the same alignment as the current CR-223 for approximately 1,500 ft, and a new at-grade railroad crossing would be constructed. The new haul road would leave the county road alignment and continue northeast to the final disposal cell location. The entire haul road would be paved.

After completion of the tailings haul and disposal cell site reclamation, the truck haul road would continue to be used as an access road to the disposal cell for inspections. Therefore, the haul road would not be reclaimed.

White Mesa Mill Site Truck Transportation Infrastructure Construction and Reclamation

The transportation trucks would use US-191 south of the Moab site through the city of Moab. The haul route would continue on US-191 south through the cities of Monticello and Blanding to the White Mesa Mill entrance (Figure 2–20). US-191 is also the main thoroughfare in Moab, Monticello, and Blanding. A new deceleration and right turn lane would be used for entering the White Mesa Mill site, and existing haul roads on the site would also be used to access the disposal cell. A new overpass with an acceleration lane would be constructed for trucks leaving the site and accessing US-191 north-bound to avoid crossing the highway's south-bound lane. The overpass would be located within the vicinity of the existing White Mesa Mill access.

The overpass and acceleration lane would be temporary structures to be used only for the life of the tailings haul. Design and construction criteria would meet AASHTO and UDOT standards with the design life a consideration. At the end of the tailings haulage, the overpass and acceleration lanes would be removed and reclaimed. The current US-191 access would remain as the site access.

2.2.4.2 Rail Transportation

The existing rail line from Crescent Junction to the Moab site, called the Cane Creek Branch rail line, would be used to transport material from the Moab site to either the Klondike Flats or the Crescent Junction sites. This rail line continues south of the Moab site and dead-ends at the Potash Mine. The only current rail traffic on this line is one train per week to serve the Potash Mine. As shown in Table 2–10, if the off-site rail transport alternative were implemented, the line would carry 4 to 8 round-trips per day from the Moab site to the selected disposal site, depending on the implemented schedule. Tailings haulage would be scheduled for 6 days per week. The 7th day, when the Potash Mine train runs, would be used as a preventive maintenance day for the tailings train.

Table 2–10. Summary Logistics for Rail Transportation from the Moab Site to Two Alternative Off-Site Disposal Cell Sites

Distances/Cycles	Klondike Flats		Crescent Junction	
One-way distance—Moab site to off-load location (miles)	18		30	
Train cycle time (hours) ^a	5–6		10–12	
Train Production	Klondike Flats		Crescent Junction	
	1 Shift	2 Shifts	1 Shift	2 Shifts
Round-trips per day	4	8	4	8
Years of operation	3.3	1.6	3.3	1.6
Debris Production	Klondike Flats		Crescent Junction	
	1 Shift	2 Shifts	1 Shift	2 Shifts
Truck loads of debris shipped per day from Moab site	2	5	2	5
Total truck loads of debris shipped from Moab site	2,188	2,188	2,188	2,188
Years of operation	3.3	1.6	3.3	1.6

^aTrain cycle time for hauling a load of tailings from the Moab site to the disposal cell would depend primarily on the distance traveled. Other factors to be considered are rail grades, spur mileage (which would have a lower speed) switching, and other material-handling activities such as loading, unloading, and decontamination. Actual one-way travel times to the Klondike Flats and Crescent Junction sites are estimated at 1.5 and 3 hours, respectively.

An existing rail bed is located along the rail line at the Moab site near the tunnel entrance. A rail siding once existed there to provide rail service to the former Moab mill operations. A new 2,000-ft rail siding would be constructed on the existing rail bed and tied into the rail line with switches. The siding would be used to load tailings onto the rail haul trains, and the rail line would be used for stacking trains and for switching. Each train would consist of 30 standard-size gondola cars, each capable of carrying approximately 100 tons of material. Thus, each train would carry approximately 3,000 tons of material.

The trains would be loaded at the Moab site siding, driven to the disposal cell siding, and unloaded. Trains would then return to the Moab site siding for another load. They would be loaded by dumping material into the top by means of a conveyor and hopper system and unloaded at the disposal site by a rotary dump mechanism that would disconnect each car from the train and rotate it (flip it) to dump the material (Section 2.2.5 describes the process of unloading railcars in more detail). All loaded cars would be covered or treated with surfactants to

suppress dust. Loaded cars would be decontaminated at the loadout station (Figure 2–21) before leaving Moab, and empty cars would be decontaminated before leaving the disposal site area.

DOE estimates that 35,000 yd³ of debris from the Moab site would not be able to be transported by rail because of limitations on the size and shape of material that could be handled by the rail access conveyor (Figure 2–21). This material would be loaded onto highway trucks and hauled to the disposal cell in the same manner as tailings in the truck transportation option. Debris haulage would be spread out over the life of the project to minimize impacts.

Summary Tabulation of Rail Transportation Logistics

Table 2–10 summarizes logistics information for rail transportation from the Moab site to the proposed Klondike Flats and Crescent Junction sites and the estimated debris production for truck shipment.

DOT Requirements

General requirements for manifests, placards, emergency planning, railcar covers, and inspections would be similar to requirements for transport by truck. Other DOT requirements specific to rail transportation would be identified in the transportation plan.

Moab Site Rail Infrastructure Construction, Operations, and Reclamation

Rail Siding

The new 2,000-ft railroad siding would commence directly north of the tunnel entrance at an existing switch point where a new switch would be added. It would require new tracks but no new earthwork. Figure 2–21 shows the Moab site and infrastructure that would be constructed to support train haulage. At the completion of the rail haul, the railroad siding would be removed and all parts recycled. The switches on the main rail line would also be removed and replaced with straight track. As seen in Figure 2–21, all proposed new rail transportation infrastructure would be located within the Moab site boundary and therefore would not constitute additional land disturbance beyond the 439-acre site area assumed to be disturbed during surface remediation.

Conveyor System Construction

The conveyor system would consist of a truck dump bin with a belt feeder at the Moab site that would feed the tailings onto a stacking conveyor belt. As described in Section 2.2.1.2, tailings would be hauled to the conveyor truck dump bin after drying. The conveyor would be used to create a storage pile over belt feeders that would feed onto a conveyor belt. The conveyor belt would exit the millsite, cross SR-279, and continue up the hillside to the railroad siding. The conveyor belt would be vertically aligned to allow clearance over the highway for traffic and not interfere with the existing overhead electric power lines. The conveyor would feed directly into the top of the loadout hopper, which when full would load the railcars by gravity from bottom gates in the hopper. The conveyor system would be totally enclosed to minimize any dust emissions and to capture any spills should they occur. The existing dirt access road that starts at SR-279 and goes to the railroad siding would be upgraded with an all-weather surfacing to allow worker access. Once completed, the conveyor system would be operated by train loadout operators and maintenance mechanics. Figure 2–21 presents the location of the conveyor system, access road, and conveyor profile.

At the completion of the rail haul, the conveyor system would be removed. The conveyor belts, belt racks, feeders, and other components in direct contact with tailings would be treated as contaminated material and disposed of at the disposal cell. Other components such as belt housings and structural steel supports would be reclaimed and salvaged as appropriate. Concrete foundations off the millsite would be demolished and disposed of at the local solid waste landfill, if uncontaminated. Concrete foundations on the millsite would be demolished and disposed of at the disposal cell, as would any contaminated rubble found off the millsite. The access roadway from SR-279 to the rail loadout station would be left in place to be used by railroad personnel for future track and tunnel inspections.

Klondike Flats Site Rail Infrastructure Construction and Reclamation

Figure 2–22 shows a conceptual plan for one possible site configuration for the infrastructure that would be constructed to support rail transportation at the Klondike Flats site. Alternate access and egress sites are possible and may be evaluated as part of the final design if this alternative were selected.

Conceptually, a new rail spur from the Cane Creek Branch railroad line would be constructed south of the Blue Hills Road turnoff. This spur would run west parallel to the south side of Blue Hills Road for approximately 1 mile, cross to the north side of the road west of the airport, and continue west parallel to the north side of Blue Hills Road for approximately another mile to a new train/truck transfer station. The spur would extend an additional 2,000 ft to allow for car stacking and would have a 2,000-ft-long rail siding constructed parallel to the rail spur at the end to allow train changeouts during operation. Support facilities for the train, such as a locomotive inspection pit, would be constructed to provide minor preventive maintenance during operations. At the transfer station would be the rotary dump, which decouples each railcar and inverts the car into a dump station for subsequent loading into trucks for final hauling and dumping into the disposal cell.

Figure 2–23 illustrates an operational rotary dump facility similar to the one proposed. The exact configuration of the rail spur and train/truck transfer station would depend on where the disposal cell was located within the Klondike Flats site.

A total of approximately 3 miles of new railroad track spur and siding would be constructed. A new switch would be placed on the Cane Creek Branch railroad line to access the spur. The new alignment would be graded, and culverts would be placed along existing washes. The track would have an at-grade crossing at Blue Hills Road. A haul road would be constructed from the rotary dump to the disposal cell. Infrastructure construction would also include the upgrade of Blue Hills Road to be used for site access. This would consist of regrading the road and making it an all-weather road by placing additional road base and a dust surfactant.

At the completion of the rail haul, the railroad switch, spur, siding, and at-grade crossing would be removed. All rail components would be salvaged. The Blue Hills Road upgrade would remain for future cell access and public access.



Figure 2–23. Operational Rotary Dump Facility

Crescent Junction Rail Infrastructure Construction and Reclamation

Figure 2–24 shows a conceptual plan for one possible site configuration for the infrastructure that would be constructed to support rail transportation at the Crescent Junction site. The trains would use the Cane Creek Branch railroad line from the Moab site to Crescent Junction and then use a short stretch of the Union Pacific rail line that runs from Ogden, Utah, to Grand Junction, Colorado. The trains would then proceed east along the Ogden/Grand Junction route for approximately 1 mile, where a new track switch to a siding to the north would be constructed. The siding would be approximately 1 mile long and would end at the train/truck transfer station. The support facilities would be the same as those described for Klondike Flats. Alternate access and egress sites are possible and may be evaluated as part of the final design if this alternative were selected.

A total of approximately 2.5 miles of new railroad track spur and siding would be constructed to access the disposal cell area. A new switch would be placed on the main rail line to access the spur. The new alignment would be graded, and culverts would be placed in existing washes.

Infrastructure construction would also include constructing an access road from existing CR-175 approximately 1,000 ft east of Crescent Junction. At this point, a new access road would be constructed north on the same alignment as the current CR-223 for approximately 1,500 ft, and a new at-grade railroad crossing would be constructed. The new access road would leave the county road alignment and continue north, paralleling the new rail spur to the transfer station. The entire access road would be gravel. At the completion of the rail haul, the railroad switch, spur, and siding would be removed. All rail components would be salvaged. The access road would remain in place to provide access to the cell.

2.2.4.3 Slurry Pipeline Transportation

The slurry pipeline transportation mode would require the construction of a buried pipeline from the Moab site to one of the three alternative off-site disposal locations. If this option were implemented, tailings would be mixed with water (repulped) at the Moab site to form a semiliquid slurry that would be pumped through the pipeline to the disposal site.

Slurry Pipelines

Slurry pipelines have been used for over 100 years in mining operations to transport both mineral concentrates (ores) and tailings, including coal, copper, iron, phosphates, limestone, lead, zinc, nickel, bauxite, and oil sands. Commercial long-distance transportation of slurries in buried pipelines began in 1967 when the 43-mile Savage River pipeline in Tasmania began transporting iron ore concentrate. It is still operational. Since then, numerous slurry pipelines, ranging in length from a few miles to the 246-mile SAMARCO Pipeline in Brazil, have been constructed in many countries. Most of them are still operating.

At the disposal site, the slurry would be dried by means of a vacuum filtration system, and the dried residue, or filter cake, would be placed in the disposal cell. The recovered water, or filtrate, would be clarified and returned through a second pipeline to the slurry preparation area at the Moab site for reuse. Pipeline Systems, Inc., conducted a conceptual study of a slurry pipeline transportation system for the Moab site. The study (PSI 2003) is incorporated into the EIS by reference and is the primary source document for the following synopsis of the slurry pipeline option.

In general, the slurry pipeline systems for the three alternative disposal sites would be very similar except for their lengths and routes, and for one booster pump facility (shown on Figure 2–15 and in Appendix C, Map 8) that would be required for the White Mesa Mill slurry pipeline because of its length. Also, the proposed slurry transport facility at the White Mesa Mill site would require the addition of a substation transformer at the Utah Power Blanding substation and a distribution circuit upgrade from the substation to the White Mesa Mill site, if the mill is also processing uranium ore in the conventional mill circuit. The proposed intermediate slurry pump booster station would require the addition of a substation transformer at the Utah Power La Sal substation and a new approximately 3-mile power line extension to the proposed site for the pump station. A distribution circuit upgrade of the existing line from the substation to its current ending point would also be required. The slurry pipeline systems would be constructed in accordance with American National Standards Institute (ANSI) standard B31.11, *Slurry Transportation Piping Systems* (ANSI/ASME 1989), which applies to the design, construction, inspection, quality control, and security requirements of slurry piping systems, and with other applicable codes.

Pipeline Corridors

Wherever possible, the three proposed corridors would follow existing gas or oil pipeline rights-of-way or road rights-of-way. For each of the three corridors, the slurry pipeline and return water pipeline would be buried in the same trench. Figure 2–15 illustrates the three proposed pipeline corridors, and the following subsections provide detailed descriptions of them. [Figure 2–25](#), [Figure 2–26](#), and [Figure 2–27](#) illustrate the details of the pipelines' final approach to the three alternate disposal cell areas. [Figure 2–28](#) illustrates the approximate locations of the proposed slurry pipeline facilities at the Moab site.

Moab to Klondike Flats Corridor

The slurry pipeline would leave the site south of US-191. The line would parallel the highway south of Moab Wash and cross under the highway 200 ft west of the wash. From that point near the old Arches National Park entrance, it would be buried under the old state highway. The route diverges from the existing US-191 alignment about 1.5 miles north of the existing Arches National Park entrance, then reconverges with US-191 approximately 1 mile south of the SR-313 turnoff. The route north from there could parallel either the existing highway right-of-way or the Williams Gas Pipeline, which is parallel to the highway. This corridor would need to cross under US-191 twice (by boring) and under Courthouse and Moab Washes and also cross one other unnamed wash by either boring or trenching. The route is characterized by rocky areas and sandy/clay sections. The length of the pipeline route for this option would be approximately 18.8 miles. See Maps 3 and 4 of Appendix C for more detailed route information.

Moab to Crescent Junction Corridor

The corridor to Crescent Junction would be the same as the corridor to Klondike Flats until that corridor deviates from the US-191 corridor and heads west towards the disposal site at Klondike Flats. The Crescent Junction corridor would continue north, paralleling the highway and the existing Williams Pipeline corridor. Approximately 4.5 miles south of I-70, the pipeline would parallel the Williams Pipeline, which heads northeast along the county road that is also a cutoff to the town of Thompson. After 4.2 miles, the pipeline would parallel a new pipeline segment that will be installed heading north to the new Williams Pipeline Corporation proposed loadout facility located north of I-70, east of Crescent Junction. In addition to the crossings cited above for the Klondike Flats corridor, the Crescent Junction corridor would also have to be bored under I-70 and under the Union Pacific Railroad. The length of the corridor from Moab to Crescent Junction would be approximately 33.7 miles. See Maps 1 through 4 of Appendix C for more detailed route information.

Moab to White Mesa Mill Corridor

Three operating gas pipelines currently exist along the proposed Moab to White Mesa Mill corridor: Northwest Pipeline (25-inch diameter), Rocky Mountain Pipeline (10-inch diameter) and Mid-American Pipeline (16-inch diameter). The White Mesa Mill corridor would leave the Moab site and run east for about 350 ft, then cross under the Colorado River. A directionally drilled, cased bore is proposed for passing under the river because it offers the highest degree of protection against pipeline damage or leaking. The existing gas pipelines were installed using this technique to avoid affecting the river, local wildlife habitat, and the residential areas of Moab. After crossing the river, the corridor would follow the existing gas pipeline right-of-way, passing around Moab along the base of the cliffs to the southwest of town. The topography along the route southwest of Moab is undulating. Soil and vegetation are sandy loam and sagebrush. After passing around Moab, the corridor would continue following the gas pipeline right-of-way along the west side of US-191.

Approximately 15 miles from the mainline pump station (PS1), which would be located on the Moab site, the corridor would depart from the US-191 right-of-way and head southwest cross-country to avoid steep canyons in the rolling, rocky terrain. This section of the corridor is characterized by weathered sandstones, rocky sandy loam, and sagebrush. The corridor would run cross-country along an oil pipeline right-of-way. This rocky section is approximately

15 miles long. At approximately 30 miles from PS1, the corridor would cross US-191 near Lopez Arch to the east side of the highway. At this location, the terrain changes from rocky rolling hills to relatively flat sandy loam and sagebrush terrain. The proposed booster pump station (PS2) would be located approximately 31.5 miles from PS1.

The corridor would depart from the gas pipeline right-of-way south of PS2 (see Map 8 in Appendix C) and proceed along the east side of US-191 (parallel to the gas pipelines). South of PS2, the terrain is generally flat with average slopes less than 2 percent up to the high point of the corridor, which is approximately 51 miles from the Moab site at an elevation of 6,970 ft above sea level. After reaching this high point, the corridor would proceed east off US-191 for 2 miles to join an existing gas pipeline right-of-way and would pass 2 miles east of the Monticello downtown area, approximately at pipeline milepost 58. From Monticello, the corridor would follow the Blanding gas pipeline right-of-way, a cross-country pipeline route that runs parallel to US-191. The Blanding gas pipeline route joins the US-191 right-of-way at Recapture Dam. The corridor would have to cross Recapture Creek just downstream of the dam and proceed parallel to US-191. The pipeline would diverge from the highway right-of-way just north of Blanding and head south, passing about 1 mile east of the center of Blanding. It would continue south along local unpaved roads or cross-country. The terrain in this area is flat with sandy loam soil, sagebrush, and farmland. Approximately 3 miles south of Blanding, the corridor would turn west and cross US-191 near the Blanding wastewater treatment plant and continue another 3 miles along the west side of US-191 to the White Mesa Mill terminal station. The length for this corridor would be approximately 88.7 miles, of which 60 miles, or about two-thirds, would be on existing gas pipeline rights-of-way; the remainder would use a combination of public and private road that does not currently contain pipeline right-of-way.

Table 2–11 summarizes the general and construction characteristics of the three proposed pipeline corridors.

Table 2–11. Summary of Pipeline Corridor Characteristics

	White Mesa Mill	Klondike Flats	Crescent Junction
General Characteristics	Length in Miles		
Total corridor length	88.7	18.8	33.7
Rock: weathered sandstone	20	7.0	26.6
Soil: sandy loam/clay and sagebrush	66.7	11.8	7.0
Crossings (roads and streams)	1	0.10	0.15
Special Construction Characteristics	Length in Feet		
Directional drilled crossings	3,500	300	300
Road bores (highway)	500	200	400
Aerial crossings	500	0	0
Stream crossings (buried)	900	100	100

System Specifications

Regardless of the corridor that would be selected, the slurry pipeline system would be designed to meet the operational parameters shown in **Table 2–12**.

Table 2–12. Slurry Pipeline System Parameters

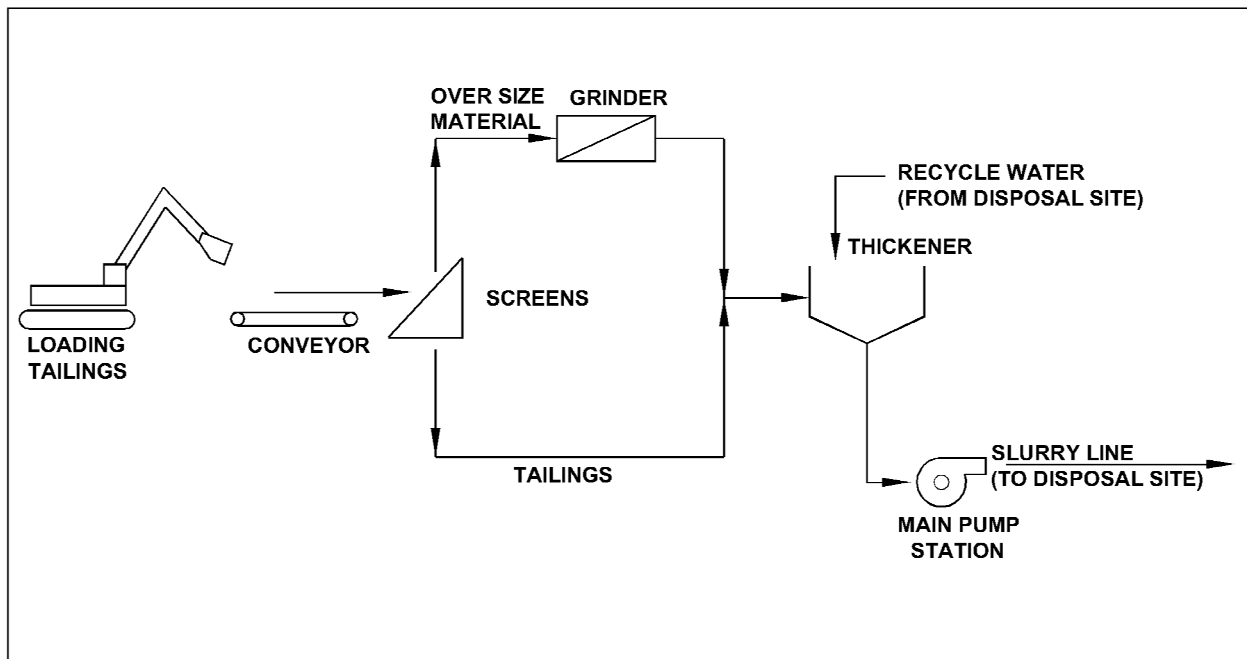
Design Life	4 years
Facility operation hours	24 hours per day 7 days per week 365 days/year
Facility overall availability	90 percent
Dry solids throughput	373 short tons per hour
Pipeline slurry concentration	50 percent by weight
Solids specific gravity	2.78
Slurry pipeline flow rate	2,031 gallons per minute (gpm)
Slurry top size	20 mesh (0.03 inch)
Dried solids (filter cake) moisture	15–20 percent by weight
Recycled water flow rate	1,172 gpm less loss from evaporation and dust control measures.
Makeup water flow rate	409 gpm

System Descriptions, Facilities, and Operations

The slurry pipeline system would comprise four major subsystems or facilities: (1) the slurry preparation plant, (2) the mainline slurry system, (3) the terminal station, and (4) the recycle water system. Each of these would be supported by integrated control and monitoring, safety, telecommunications, and electrical systems.

Slurry Preparation Plant

The slurry preparation plant would be located in the tailings pile area of the Moab site and would be common to all three corridors. The primary function of the plant would be to repulp the tailings, regrind oversized tailings, and deliver the required 20-mesh (0.03-inch) slurry to the mainline pump station (PS1). [Figure 2–29](#) illustrates the slurry preparation plant’s process flow.



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Figure 2–29. Slurry Preparation Plant Process Flow Diagram

Tailings would be excavated as described in Section 2.2.1.2 and delivered to the slurry preparation plant by conveyor, where they would be freed of debris, sized, and amended with water to form a slurry that would be thickened to a 50-percent solids concentration and pumped to the mainline slurry system. Sieved-out material would be milled and reprocessed. Large debris would be removed for truck transport.

Mainline Slurry System

The mainline slurry system would pump the slurry from the Moab site to a terminal at the off-site disposal location. It would comprise (1) a main pump station, which would be common to all three disposal terminal alternatives; (2) a booster pump station, which would be used only if the White Mesa Mill off-site disposal alternative were implemented, (3) a 12-inch-diameter steel pipeline; and (4) one or two pressure monitoring stations. [Table 2–13](#) summarizes the mainline pump operating characteristics.

Table 2–13. Mainline Slurry Pump Characteristics

Slurry Pipeline Corridor	Maximum Mainline Pump Flow Rate (gpm)	Mainline Pump Discharge Pressure (pounds per square inch)	No. of Pump Stations	Total Horsepower
Moab site–White Mesa Mill	2,153	2,800	2	8,276
Moab site–Klondike Flats	2,153	1,200	1	1,773
Moab site–Crescent Junction	2,153	2,000	1	2,956

gpm = gallons per minute

Terminal Station

At the terminal station, the incoming slurry would be dewatered by vacuum filtration. The suction would produce a filter cake with approximately 15- to 20-percent moisture that would be disposed of in the disposal cell. The filtrate (recovered water) would be diverted to a double-lined holding pond or a wet cell, clarified, and pumped back to the slurry preparation plant through the recycle water pipeline. Even if dewatering operations were temporarily down, pipeline operations at White Mesa Mill could continue for weeks (operations at the other sites could continue for several hours) by using the station’s wet cell to receive and temporarily store incoming slurry. In the event of a shutdown, the system would be able to be restarted without significant delay. The filter plant process flow diagram is illustrated in [Figure 2–30](#).

Recycle Water System

The recycle water system would return approximately 80 percent of the slurry water to the Moab site for reuse. Due to some losses of water in the slurry preparation plant, filtering plant, and holding pond, approximately 400 gallons per minute (gpm) of additional (makeup) water would be required at the Moab site either from the Colorado River or from the terminal site, if makeup water were available at the terminal site. Makeup water would be available at the White Mesa Mill site, but the Klondike Flats and Crescent Junction sites would both require installation of new wells. [Table 2–14](#) summarizes the mainline recycle pump operating characteristics.

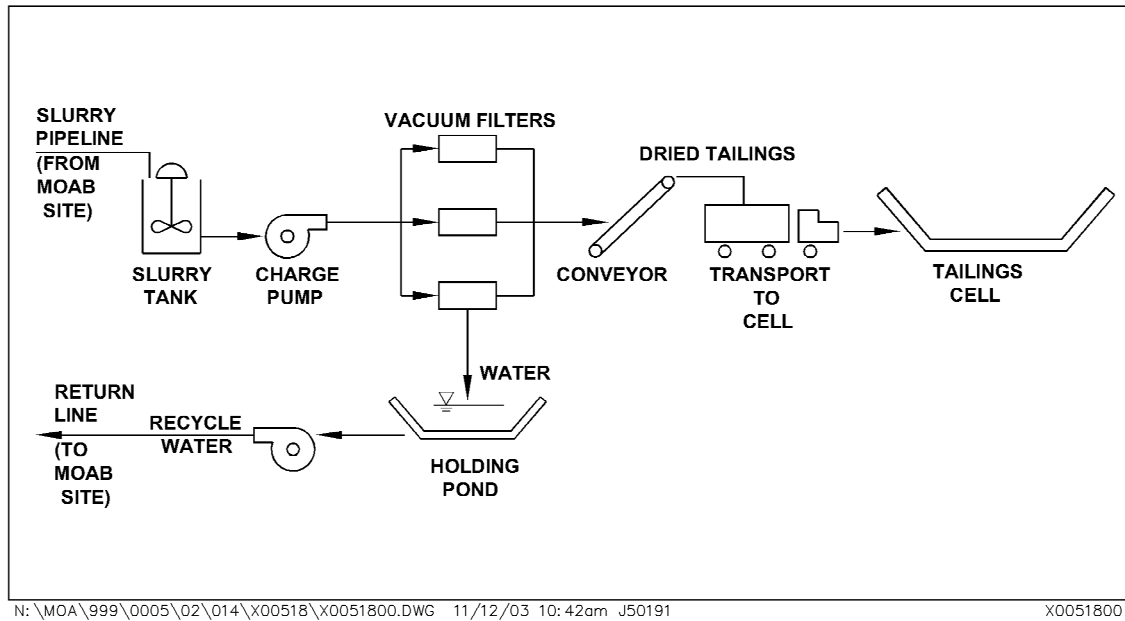


Figure 2-30. Filter Plant Process Flow Diagram

Table 2-14. Mainline Recycle Water Pump System Characteristics

Recycle Water Pipeline Corridor	Flow Rate (gpm)	Discharge Pressure (pounds per square inch)	No. of Pump Stations	Total Horsepower
Moab site-White Mesa Mill	1,172	940	1	918
Moab site-Klondike Flats	1,172	380	1	371
Moab site-Crescent Junction	1,172	640	1	625

Facility Footprints

Table 2-15 gives the estimated square footage requirements for the proposed facilities.

Table 2-15. Facility Land Use Requirements (Footprints)

Facility/Location	Footprint (ft ²)
Moab (common to all site alternatives)	67,000
Booster pump station (White Mesa Mill alternative only)	16,500
Terminal (common to all site alternatives)	40,625

Control/Monitoring and Safety Systems

Control and Monitoring

The slurry pipeline system would be controlled and monitored from a control room at the Moab site, which would be manned constantly. Control room operators/dispatchers would be alerted automatically if abnormal or emergency conditions, such as off-specification slurry, a leak, or a plug in the pipeline, were to occur. System control would be automatic in the steady-state mode. Operator intervention would be required only during process upsets, shutdowns, and restarts. For the White Mesa Mill corridor, isolation valves would be included at both sides of the Colorado River to minimize the possibility of slurry entering the river if a leak were to occur.

Safety

- *Leak Detection and Management*—The pipeline would contain only noncompressible, nonflammable, semiliquid slurry that would not pose an explosion or fire hazard. However, high-pressure slurry could be aggressively abrasive if a leak were to occur. The pipeline would be continuously monitored by a leak detection system. This system would provide operating data for the Supervisory Control and Data Acquisition (SCADA) system via a fiber optic telecommunication system. Flow rate, pressure, and density would be monitored at various points along the pipeline. A pressure monitoring station (two for the White Mesa Mill corridor) with a pressure transmitter powered by a solar panel or other power source would be installed. The objective of the leak detection system would be to detect leaks within 2 to 10 minutes of occurrence (depending on the size and the location of the leak), predict their location, and issue warnings to operators. If there were an indication of a leak, an inspection team would be dispatched. DOE's estimated theoretical spill volume for a pipeline leak is 0.65 to 1.3 yd³ during the sensing period and 4 yd³ after the system is shut down. The total spill volume for a leak is expected to be less than 5.2 yd³ (PSI 2003).
- *Overpressurization Protection*—The pipeline and equipment would be protected from overpressurization by several levels of protection, including proven operating procedures, use of SCADA system software, electrical or hardware interlocks or control loops, and mechanical pressure-relieving devices.
- *Rupture Contingency Plan*—In the unlikely event of a pipeline rupture, installed systems would warn the operator with a prompt to consider activating an emergency shutdown sequence if the data appear valid. A break would result in some slurry loss. Repairs and cleanup, including lining repairs for short sections, could be made in a matter of a few days to 2 weeks.
- *Buried Pipeline*—Although the pipeline could be installed above ground and operated safely, DOE proposes to bury it in order to minimize conflicts with the public and also to prevent punctures from causes such as vehicles and gunshots.

Additional design techniques and safety factors would be applied for all special design points (e.g., thicker steel pipe wall at the river crossing). In areas of potentially severe erosion, design provisions would be based on maximum predicted flood events.

Post-Operational Activities

Post-operational activities would depend on DOE's ultimate decision on the fate of the pipeline. Some commentators have suggested that upon completion of slurry transportation activities the pipeline could be retrofitted for irrigation or other uses. However, any decision on such a future use would be predicated first on a decision that the use would be appropriate and second that a radiological release of the pipeline would be feasible and acceptable. These decisions could not be made until slurry transportation was complete. If DOE decided that other pipeline uses were not appropriate or feasible, upon completion of pipeline slurry operations, DOE would dig up the buried pipelines, compact them, and dispose of them in the disposal cell. The disturbed pipeline right-of-way would then be reclaimed and revegetated.

2.2.5 Construction and Operations at the Off-Site Disposal Locations

This section describes construction and operations at the off-site disposal locations. These activities would be essentially identical for the proposed Klondike Flats and Crescent Junction

sites. Consequently, Section 2.2.5.1 describes activities for these two sites in terms of a “reference cell” that applies to both sites. The proposed cell design for the White Mesa Mill site is somewhat different because it is based on IUC’s proposed design (IUC 2003). It is discussed separately in Section 2.2.5.2. For the purpose of describing these activities, the following sections address five main elements: (1) site preparation, infrastructure development, and control, (2) disposal cell construction, (3) tailings placement operations, (4) disposal cell cover construction, and (5) site reclamation.

2.2.5.1 Reference Disposal Cell

Figure 2–16 is a reference disposal cell site plan illustrating the major site features and approximate locations of temporary areas and facilities that would be used under the truck or slurry pipeline transportation alternative. Under the rail transportation alternative, the decontamination facility, worker access control, parking, fuel storage, and some stockpile areas would be located next to the train transfer point rather than adjacent to the disposal cell.

Site Preparation, Infrastructure Development, and Controls

Access Roads

The disposal cell would require new roads throughout the site to control the flow of traffic, allow access to material deliveries, and allow access to and from the contaminated haul road. DOE estimates that approximately 3,500 ft of contaminated and clean access roads combined would be required. New access roads would be 30 ft wide with a compacted gravel surface. Gravel road would be treated with dust control surfactant to reduce the need for water-consuming dust control measures.

Storm Water Control and Management

There are no major drainage channels currently entering any of the three alternative sites. Storm water management controls would be regulated under the Utah Pollutant Discharge Elimination System General Permit for storm water discharges from construction activities. Normal storm water control requirements generally are designed to control a reference storm event of a 25-year magnitude. Runoff ponds and ditches would be constructed at the transportation transfer station and the disposal cell to divert storm water away from facilities and operational areas. Hay bales and silt fences would be constructed to control sediment transport.

Radiological Controls

Radiological controls and decontamination procedures at the disposal cell would be functionally and operationally similar to those described in Section 2.1.1.1 and 2.2.1.1. One central access control location would be designated at either the disposal cell area entrance or the train/truck transfer station entrance for site radiological control as shown in Figure 2–16 (truck or pipeline transportation) and [Figure 2–31](#) (rail transportation).

For the truck haul and slurry pipeline transportation alternatives, the contamination area boundary would encompass the disposal cell area and supporting construction facilities but would exclude the office trailer and parking lot areas. For the rail haul transportation alternative, the contamination area boundary would encompass the train/truck transfer station, the

contaminated haul road from the transfer station to the disposal cell, and the disposal cell area but would exclude the office trailer and parking lot areas at the transfer station. Contamination control fencing would separate contaminated and uncontaminated areas at the transfer station and delineate the cell perimeter and both sides of the 2-mile haul road.

Water Storage Towers

Water storage towers would be placed at the disposal site and used to store water for nonpotable use such as soil compaction and dust control. Water from the Colorado River (allocated under existing water rights held by DOE, which authorize 3 cfs consumptive use) would be taken from the Moab site water storage ponds, loaded onto tanker trucks, and transported to the off-site disposal location, where it would be transferred into off-site storage towers (or possibly ponds).

Temporary Field Offices

The temporary field offices would be similar to those described in Sections 2.1.1.1 and 2.2.1.1 except that estimated discharge to the sanitary holding tank would be approximately 4,000 gallons per day. Potable water supply to the site would be locally supplied and delivered in portable, trailer-mounted water storage tanks and plumbed into the office units where appropriate. The offices would be located as illustrated in Figure 2–16 (truck or pipeline transportation) or Figure 2–31 (rail transportation).

Staging and Vehicle Maintenance Area

A staging area and a vehicle maintenance area would be constructed for storage of incidental construction materials and equipment and for on-site vehicle maintenance. Construction materials and equipment would require approximately 1 acre of open field for storage and would not require physical structures. The maintenance area would include construction of a portable structure (pole and canvas, 30 by 100 ft, dirt floor) to fully enclose excavation equipment requiring major equipment maintenance.

Fuel Storage and Refueling Area

Fuel would be supplied by local vendors and stored on the site. A central delivery point would be used to transfer the fuel to on-site 20,000-gallon fuel storage tanks. Multiple tanks would be located at both the Moab site and the off-site disposal location to accommodate fuel consumption requirements. Tank volumes would be sufficient to provide 1 week of demand. Refueling would require construction of a spill containment structure to safeguard the environment in the event of a spill. Vehicles and equipment would refuel as needed without exiting the contamination area under strict refueling plan guidelines. The areas would be located as illustrated in Figure 2–16 (truck or pipeline transportation) or Figure 2–31 (rail transportation).

Train/Truck Transfer Facility

For the rail transportation option only, a temporary train/truck transfer facility would be constructed to transfer tailings from the railcars to haul trucks. Figure 2–31 presents the overall plan for this transfer facility. It would consist of the rail spur and two sidings to allow train switchouts, a rotary bin to rotate and dump the railcars, a railcar decontamination station, a locomotive inspection pit, and a train fueling station. This area would also include support facilities for off-road haul truck maintenance and fueling and other site support facilities

previously described, including field offices, equipment decontamination facilities, employee parking lots, and personnel radiological access control module.

Railcar Unloading and Decontamination

Gondola railcars delivering tailings to the train/truck transfer station would be guided into an open structure containing the rotary dump facility. The facility would consist of the rotary dump mechanism and a concrete bin directly below it to receive the dumped material. The train would approach the facility, and a car would be positioned in the center of the rotary dump. The railcar would be disconnected from the rest of the train. The rotary mechanism would connect to the car and then rotate it approximately 135 degrees to empty the car contents into the lower-level concrete bin (see Figure 2–23). The tailings would then be picked up by front-end loaders and loaded into haul trucks.

After dumping, the rotary mechanism would set the railcar upright, and the railcar would be reattached to the train. The train would pull the car forward into the decontamination area. Another full railcar would be positioned in the rotary dump, and the dumping process would be repeated. While the next car was unloaded, the previously unloaded car would be decontaminated. Its exterior would be decontaminated using high-pressure water hoses to remove visible contamination. Decontamination water would be captured below the decontamination pad in a process similar to that at the truck/equipment decontamination facility. It would flow through piping to a double-lined decontamination pond for reuse. Although most of the water would be recycled, some would be lost through evaporation. All decontamination wastewater remaining at the end of operations would be used for either moisture conditioning and compaction of cell materials or for dust control inside the cell construction area and would not be discharged to the ground water or surface water system. After decontamination, the railcar would be inspected, decontaminated again if necessary, and released. This process would be repeated for all cars until the entire train was emptied and decontaminated. It would then return to the Moab site for reloading. The unloading facility would include a rail siding adjacent to the track used for unloading. The additional siding would be used to stack a waiting train and for switching out trains to avoid track conflict.

Contaminated Haul Road to Disposal Cell

The rail transportation option would also require construction of a 30-ft-wide gravel-surfaced haul road from the transfer station to the disposal site; the length of the haul road would depend on the exact location of the disposal cell. The Crescent Junction haul road could be 1,000 to 8,000 ft long, and the Klondike Flats haul road could be 6,000 to 12,000 ft long. Haul trucks would deliver the tailings to the disposal cell. Stripping operations would remove and stockpile approximately 400 yd³ of topsoil material strategically along the roadway alignment. The alignment would be finish-graded and would receive a 12-inch layer of compacted roadbase. Dust control surfactants would be applied.

Disposal Cell Construction

Topsoil Stripping and Stockpiling

The reference disposal cell footprint is a 3,340- by 1,670-ft rectangle on a relatively flat surface. Stripping operations would remove approximately 12 inches of topsoil from the cell footprint, haul road, stockpile areas, runoff collection pond, and runoff ditches; the estimated volume of

stripped topsoil would be 234,000 yd³. The stripped topsoil would be stockpiled for subsequent use in the final cover. Concurrently with topsoil stripping, runoff ponds and ditches would be constructed and water trucks would provide dust control as needed.

Excavation

The total volume of excavation would be approximately 3.5 million yd³. Cell excavation would proceed sequentially in four relatively equal “subcell” areas. The cell would be excavated to a nominal depth of approximately 18 ft below grade, although the as-built dimensions could vary when the final location was chosen and actual site grade conditions were evaluated. The final cell configurations would also extend 29 ft above grade. The below-grade walls of the cell would slope inward at a 2H:1V slope. Excavated material would be hauled, dumped, and spread around the perimeter of the subcell to accommodate construction of the buttress as the excavation progressed. As material was delivered to the buttress area, soil compaction equipment would compact the buttress material.

Upon completion of subcell 1, excavation of subcell 2 would begin (Figure 2–32). A separation berm between subcells would serve as a haul route into the cell for the tailings filling operations. The excavation process would proceed in a similar manner until subcell 4 was complete. Additional cell volume above the estimated required size could be necessary to accommodate volumes of tailings that were underestimated or unaccounted for. Throughout excavation operations, a survey crew would maintain grade control, soil testing technicians would provide testing information for compaction and moisture control, and water trucks would provide dust control and soil moisture control support.

Subgrade Preparation

When excavation operations for subcell 1 were complete, subgrade preparations (that is, preparing the base of the cell to receive tailings) would commence. On the basis of past knowledge and the known geologic characteristics of the disposal site areas, DOE assumes that the subgrade materials would meet permeability requirements (see Appendix B) and that low-permeability additions to the existing soils would not be necessary. However, if testing were to prove otherwise, mitigating measures such as addition of bentonite to the subgrade soils would be employed. The subgrade surface preparation would consist of scarifying to a depth of 12 inches, moisture-conditioning to optimum moisture content (i.e., to achieve optimum compaction), processing the moisture and bentonite into the soil, and compacting the surface to its maximum density. Once subgrade grading and compaction requirements for subcell 1 were satisfactorily met, tailings placement would begin in subcell 1, and the subgrade preparation crew would move to subcell 2 to repeat the subgrade preparation operation. This sequence is illustrated in Figure 2–32.

Water from rainfall or construction activities in the individual cells would be collected in a lined sump to minimize seepage and conveyed from the cell for use in moisture conditioning or dust control. The lined sump would be removed before cell closure.

Tailings Placement and Compaction

Haul trucks would arrive at the disposal site by (1) direct haul from the Moab site, or (2) haul from the train/transfer station, or (3) haul from the slurry pipeline dewatering facility. The trucks would dump the tailings, dozers would spread the tailings to the precompaction thickness of 12 inches, and compaction equipment would compact them.

Optimum moisture content refers to the amount of moisture in the tailings that would allow the maximum control over compaction (e.g., sufficient moisture to lubricate the mineral grains). DOE assumes that the moisture content of the tailings arriving in the cell would be at or near its optimum for disposal in the cell, and that little, if any, processing would be required. However, in the event wetting or drying were needed, water trucks and tractors with disc harrow attachments would be employed to achieve the requisite moisture level.

Tailings would be loaded to an average above-grade depth of approximately 30 ft (Figure 2–33). When the loading of subcell 1 was complete, cover construction operations could commence. The tailings placement process would proceed sequentially until subcell 4 was complete to final grades.

Disposal Cell Cover Construction

The technical basis, as well as the basic types and thicknesses of cover construction materials for the reference off-site cover, would be similar to those previously described for the cover proposed for the Moab site under the on-site disposal alternative in Sections 2.1.1.3 and 2.1.3.1, and in Appendix B. However, the reference cell cover would be larger in overall area because of the configurational differences of the off-site cell and the Moab site tailings pile and because, in contrast to the Moab site cover, the off-site cover would overlie the buttress as well as the emplaced tailings. Also, only the vegetated erosion protection (riprap mixed with soil) would extend over the clean-fill buttress.

Borrow materials and excavated soil for constructing the buttress and cover would be delivered or stockpiled on the disposal cell site during the cell excavation and tailings placement operations. Cover construction would commence in subcell 1 of the disposal cell after tailings placement was complete and placement operations had moved into subcell 2. The final cover footprint would require an additional surface area of 63 acres of disturbance outside the disposal cell footprint. The total depth of the finished cover over the tailings would be 6 ft, and the total height of the completed cell would be up to 35 ft above grade. Figure 2–34 illustrates the reference cell cover and cover layer surface dimensions. The following subsections describe the amounts and placement of cover materials (see Figure 2–35).

Radon/Infiltration Barrier

Approximately 294,000 yd³ of radon/infiltration barrier material stockpiled on the site would be transported to the cell area and emplaced on the tailings in three loose lifts, or stages, that would be sequentially compacted to a final required 1.5-ft thickness and reference density. The final placement would be graded to finish-grading specifications. If necessary, water would be added to achieve optimum moisture content for compacting.

Coarse-Sand/Fine-Gravel Capillary Break

The capillary break layer would be approximately 215,750 yd³ of a selected blend of coarse sands and fine gravels. The material would be transported from the stockpile area to the cover placement area and dumped. It would then be spread and compacted to a depth of 6 inches. The material would be compacted in its natural moisture state and would have no moisture content or density requirements.

Fine-Grained (Water Storage) Soil Layer

The fine-grained soil layer would be approximately 1.1 million yd³ of a borrow material that would be imported and stockpiled on site. The material would be spread to a loose depth of 3.5 ft. It would have no moisture content or maximum density placement requirements.

Soil/Rock Admixture Layer

The soil/rock admixture layer would consist of approximately 154,000 yd³ of borrow material, of which 20 percent would be riprap no greater than 12 inches in diameter. It would be spread to a final loose depth of 6 inches and would have no moisture content or maximum density placement requirements. Once satisfactory depths and mixture ratio were achieved, a tractor and disc harrow would blend the two soil types.

Side Slope Riprap/Soil-Filled Voids Layer

The riprap/soil-filled voids layer would consist of approximately 43,000 yd³ of borrow material, of which 20 percent would be riprap no greater than 12 inches in diameter. The riprap would be placed to a final depth of 12 inches and would have no moisture content or maximum density placement requirements. Once satisfactory depths were achieved, soil would be placed over the riprap to fill voids. A tractor and chain/blanket mat would pass over the soil to work the material into the voids. Areas that received a surplus of soil would require hand raking to achieve uniform placement.

Site Reclamation

Before the last portion of the cover was emplaced, removal of contaminated facilities and contaminated areas of temporary construction facilities would begin. Noncontaminated temporary facilities such as office trailers, access roads, and employee parking lots would remain until the end of cell cover placement.

All disturbed areas within the contaminated site boundary would be verified to meet cleanup standards prior to cell closure and backfill. Any contaminated material would be excavated and placed in the disposal cell. Areas of surface disturbance caused by construction activities outside the disposal cell final footprint and permanent drainage ditches, such as areas that supported construction of haul and access roads, construction facilities, construction materials, and cover material stockpiles, would be rough-graded and backfilled with the remaining topsoil stockpiled from stripping operations. The topsoil would be excavated from the stockpile area, transported to these areas, dumped, and graded in preparation for final reclamation. Impermeable membrane liners used in decontamination ponds, storm water control ponds, and slurry operations would be

removed and disposed of in the disposal cell. The ponds would be backfilled to original grades prior to final reclamation.

All remaining structures and facilities used for cell construction and loading, including buildings, trailers, fuel storage areas, concrete slabs, water towers, and all elements of the transportation infrastructures, would be disassembled and either disposed of in the cell, salvaged, or properly disposed of in accordance with applicable federal, state, and local requirements.

The disposal cell site would be completely fenced with standard 6-ft-high chain-link security fencing with a three-strand barbed wire top and gated at the access road. The proposed fence area is illustrated in Figure 2–34. Final reclamation activities would be implemented at the cell disposal area and transportation facility area and would consist of seeding with native or adapted plant species.

2.2.5.2 *White Mesa Mill Disposal Cell*

The design and specifications proposed for the White Mesa Mill site are somewhat different from those proposed for the Klondike Flats and Crescent Junction sites because they are based on an unsolicited proposal submitted to DOE by IUC (IUC 2003). This cover approach reflects an alternative design that is more typical of UMTRCA Title II uranium mill tailings reclamation and is similar to that proposed in NRC's 1999 EIS (NRC 1999). A brief description of the White Mesa Mill cover design is included in Appendix B. DOE has reviewed the design and has determined it to be reasonable at the conceptual level. This section describes the activities that would occur if the IUC proposal were implemented. The conceptual design is strictly intended to establish a reasonable basis for evaluating environmental impacts associated with this component of site remediation and reclamation. This assumed design is not intended to commit DOE to any specific cover design.

IUC proposes to dispose of contaminated materials from the Moab site and vicinity properties at its White Mesa Mill site, assuming it received a license amendment from the State of Utah for its current operations there. Although the facility has an NRC-issued license to receive, process, and permanently dispose of uranium-bearing material, it would need a license amendment from the State of Utah before it could accept material from the Moab site. (Effective August 16, 2004, NRC transferred to Utah the responsibility for licensing, inspection, enforcement, and rulemaking activities for uranium and thorium milling operations, mill tailings, and other wastes.) If the IUC White Mesa Mill were selected as the final disposal site for the Moab tailings, the proposed changes to IUC disposal capacity and engineering design would require prior UDEQ approval and issuance of a State Construction Permit and possibly a modification of a State Groundwater Quality Discharge Permit. The *Utah Administrative Code* R313-24-4(1)(b) requires the White Mesa Mill site to comply with state requirements for ground water protection. Details regarding appropriate engineering design, construction requirements, operational mandates, monitoring needs, and closure stipulations would be determined by UDEQ at that time. Disposal of the Moab tailings at White Mesa Mill would be performed under a reclamation plan approved by the State of Utah. Because IUC's cells and reclamation plans would be state-approved, DOE assumes that they would meet all applicable state and federal regulations. IUC would be responsible for all material, design, and performance compliance issues concerning disposal operations, cell construction, and cover performance. Tailings placement would be performed under IUC's direction by either IUC personnel or by an outside contractor. IUC

would oversee the outside contractor and would be responsible for quality assurance/quality control to ensure that all design and performance specifications were met.

Tailings would be transported approximately 85 miles to the White Mesa Mill site by either truck or slurry as described in Section 2.2.4. Under the slurry transport option, IUC would take ownership of the Moab site tailings at the entrance to the slurry pipeline system. If the tailings were trucked, DOE would retain ownership until they were received at the White Mesa Mill site.

Summary of IUC's White Mesa Mill Disposal Cell Construction and Operations Proposal

Figure 2–36 illustrates the general layout of the IUC's proposed wet and dry cell, and Figure 2–37 is a schematic cross-section. The cell would be approximately 18 ft below grade. Dimensions would depend on the final cell location and configuration, which would be based on actual site grade conditions. The interior cell sideslopes below grade would be constructed at 3H:1V. Excavation operations would remove subgrade materials to the final depth of the cell, which would have a 12-inch compacted clay liner. Excess excavated material would be delivered to the buttress area, where soil compaction equipment would compact it to form the cell buttress. The cell buttress would have 5H:1V exterior slopes. After the starter cell was filled, excavation and tailings placement would proceed sequentially as previously described for the Klondike Flats and Crescent Junction cells. Maximum cell dimensions would be approximately 3,500 by 1,800 ft, creating a disposal cell approximately 145 acres in area. Final cell size would be determined by the final quantity of tailings placed.

If the tailings were delivered by slurry pipeline, they would be processed as described in Section 2.2.4 and placed in a 30-acre “starter” dry cell that would be constructed for initial storage. Fluids not immediately repiped to Moab would be stored in a “wet” cell for later use as makeup water. The wet cell would have a geosynthetic high density polyethylene liner (Figure 2–38).

Truck-transported tailings or dried slurry materials from interim storage would be placed in the cell using conventional earth-moving construction techniques. In the case of truck-transported materials, the highway trucks would dump their loads, and front-end loaders would transfer tailings to off-highway (on-site) trucks for delivery to the dry cell. Deposited tailings would be bladed to a depth of 6 to 9 inches prior to compaction to 90 percent of maximum dry density. A water truck would provide water for dust control or for any moisture necessary for compaction. Dry cell placement would be continuous as excavation and preparation of cell capacity progressed ahead of tailings placement.

A survey crew would maintain grade control throughout the excavation operation. Soil testing technicians would provide information for compaction and moisture control. Water trucks would operate in tandem with the construction operations to provide dust control during excavation operations and soil moisture control for construction of the buttress.

Approximately 35,000 yd³ of debris are believed to exist in the Moab site. Debris would be transported by truck to White Mesa Mill for placement in the dry cell. Before leaving the site, trucks would be scanned for radioactive contamination and decontaminated at a wash facility operated by the mill. DOE estimates that approximately 2,200 truckloads of debris would be shipped.

Summary of IUC's White Mesa Disposal Cell Cover Proposal

Figure 2–39 illustrates details (materials and thicknesses) of a typical reclamation cover that IUC proposes to construct. This proposed cover differs somewhat from the cover previously described for the reference cell but is typical of other NRC-approved covers for private licenses.

Components of the final top cover from the top down would consist of erosion protection riprap, a frost barrier, a compacted clay radon barrier, and a platform fill layer directly over the tailings. The side slope cover would consist of random fill covered by riprap. On-site borrow is available for all material except the riprap. Quarries located north of Blanding, approximately 8 miles from the White Mesa Mill site, would be used as the riprap source. Placement of these layers would be similar to that previously described for the reference cell. The materials would be stockpiled near the cell, then emplaced and compacted using standard construction equipment and techniques.

2.2.6 Monitoring and Maintenance

After completion of tailings placement and site reclamation, monitoring and maintenance of an off-site disposal cell at any of the three proposed locations would be in accordance with the Long-Term Surveillance and Maintenance Plan approved by NRC. Drainage areas and other areas susceptible to erosion would be inspected and repaired as needed.

Monitoring and maintenance procedures for the reference off-site disposal cell and the White Mesa Mill off-site disposal cell would be similar but not identical. An example of how monitoring and maintenance at the White Mesa Mill disposal cell would differ from the reference cell would be the need to manage storm water and internal infiltration drainage from upslope disposal cells at the White Mesa Mill site. There are no preexisting upslope cells with the reference cell design. Another example would be the need to operate and monitor the liner, drains, and leak detection system that would ostensibly be left in place in cell 4B at the White Mesa Mill site. This type of drainage system would not be used with the reference cell design.

2.2.7 Resource Requirements

This section describes DOE's estimate of the major resource requirements for the off-site disposal alternative.

2.2.7.1 Labor

Table 2–16 through Table 2–18 show the estimated average annual labor requirements. In all cases, the labor category "Site Support" represents construction oversight personnel employed by the Technical Assistance Contractor for DOE.

Off-site disposal would require construction labor to be performed at the Moab site, vicinity properties, borrow areas, and the selected disposal cell site. It would also require transportation-related labor. DOE's estimates of the average annual labor requirements for construction-related activities for the Moab site, vicinity properties, borrow areas, and the selected disposal cell would be the same for all three modes of transportation. In general, single numbers in Table 2–16 through Table 2–18 indicate the labor for a single 12-hour shift working 7 days a week, 350 days a year. A double-shift schedule would require 67 to 100 percent more total work force to accomplish the same work. Where dual numbers are shown in the tables, they indicate the labor required for a single 12-hour shift (lower number) versus a double 10-hour shift schedule.

Table 2–16. Average Annual Labor Requirements—Truck Transportation

Labor Category	Construction Labor				Transportation Labor		
	Moab Site	Vicinity Properties	Borrow Areas	Disposal Cell	Klondike Flats	Crescent Junction	White Mesa Mill
Equipment Operators	25	6	7	28	–	–	–
Site Support	19	4	3	16	9–18	9–18	10–20
Truck Drivers	1	3	2–10	8	34–61	50–87	109–192
General Labor	22	10	10	18	–	–	–
Mechanics	–	–	–	–	3–5	4–7	8–17
Total Average Workforce	67	23	22–30	70	46–84	63–112	127–229

Table 2–17. Average Annual Labor Requirements—Rail Transportation

Labor Category	Construction Labor				Transportation Labor	
	Moab Site	Vicinity Properties	Borrow Areas	Disposal Cell	Klondike Flats	Crescent Junction
Equipment Operators	25	6	7	28	–	–
Site Support	19	4	3	16	–	–
Truck Drivers	1	3	2–10	8	3–6	3–6
General Labor	22	10	10	18	–	–
Conveyor Operators/Crew	–	–	–	–	6–10	6–10
Train Engineer	–	–	–	–	9–14	17–28
Train Maint. Crew	–	–	–	–	1	1
Total Average Workforce	67	23	22–30	70	19–31	27–45

Table 2–18. Average Annual Labor Requirements—Slurry Pipeline Transportation

Labor Category	Construction Labor				Transportation Labor		
	Moab Site	Vicinity Properties	Borrow Areas	Disposal Cell	Klondike Flats	Crescent Junction	White Mesa Mill
Equipment Operators	25	6	7	28	–	–	–
Site Support	19	4	3	16	4	4	4
Truck Drivers	1	3	2–10	8	3–6	3–6	3–6
General Labor	22	10	10	18	–	–	–
System Operators	–	–	–	–	21	21	25
Pipeline Construction	–	–	–	–	250	330	502
	–	–	–	–	–	–	–
Total Average Workforce	67	23	22–30	70	28–31^a	28–31^a	32–35^a

^a Excludes pipeline construction labor. The duration of pipeline labor would be 9 months for White Mesa Mill, 7 months for Crescent Junction, and 6 months for Klondike Flats, and its labor requirements are not included in annual averages.

2.2.7.2 Equipment

Table 2–19 through Table 2–21 represent average annual equipment requirements for the off-site disposal alternative. Off-site disposal would require construction equipment at the Moab site, vicinity properties, borrow areas, and the selected disposal site. It would also require transportation-related equipment. (For the pipeline option, transportation-related equipment is considered to include pipeline construction equipment.) DOE’s estimates of the average annual equipment requirements for construction-related activities for the Moab site, vicinity properties, borrow areas, and the selected disposal cell are the same for all three modes of transportation.

Table 2–21. Average Annual Equipment Requirements—Slurry Pipeline Transportation Mode

Equipment Type	Construction Equipment				Transportation Equipment		
	Moab Site	Vicinity Properties	Borrow Areas	Disposal Cell	Klondike Flats	Crescent Junction	White Mesa Mill
Tractor	2	–	–	1	–	–	–
Backhoe	1	1	1	2			
Grader	1	–	1	2	1	1	2
Trackhoe	1	–	–	1	2	4	10
Front-end loader	2	1	1	2	1	2	4
End dump truck	–	1	–	1	1	2	4
Water truck	1	1	1	2	1	1	1
Crane	1	–	–	–			
21 yd ³ scrapers	3	–	1	6			
Dozer	3	–	1	2	8	7	18
Sheepfoot compactor	1	–	–	2	–	–	–
Pickup truck	4	2	1	4	17	18	27
Welding rig	1	–	–	–			
Skidsteer	–	2	–	1			
16 yd ³ drag line	2	–	–	–	–	–	–
Tandum trucks	–	–	1–7 (per shift)	3	–	–	–
Tandum trucks (debris haul)	–	–	–	–	2–5	2–5	2–5
Flatbed truck	–	–	–	–	1	2	5
Crane	–	–	–	–	1	1	1
Side boom crane	–	–	–	–	2	3	8
Trencher	–	–	–	–	1	1	2
Total	23	8	8–14	29	38–41	44–47	84–87

2.2.7.3 Land Disturbance

Table 2–22 summarizes DOE’s estimates of the acres of land that would be disturbed under the off-site disposal alternatives. These disturbances include those that would result from remediation of the Moab site and vicinity properties, disposal cell construction at off-site locations, construction of transportation infrastructures, and excavation of borrow material. Estimates of required volumes of borrow material are shown in Table 2–7. The final area of land disturbed at borrow areas would vary depending on the final selection of borrow areas (see Table 2–6) and the depth to which borrow soils could be extracted. The values shown for disturbances to borrow areas in Table 2–22 represent DOE’s estimate of the maximum disturbance.

2.2.7.4 Fuel

Table 2–23 summarizes DOE’s estimates of the fuel consumption for the three off-site disposal alternatives and modes of transportation.

2.2.7.5 Water

The discussion of potable and nonpotable water uses in Section 2.1.5.5 also applies to the off-site disposal alternative. Table 2–24 shows the estimated nonpotable water consumption for the three transportation modes for all three off-site disposal locations. It is assumed that DOE’s Colorado River water rights would supply nonpotable water for the Klondike Flats and Crescent Junction off-site disposal alternatives and part of the White Mesa Mill site needs. The remainder of nonpotable water needed for the White Mesa Mill site would be supplied from water rights to Recapture Reservoir or deep wells at the millsite. Rail and truck transportation options show a range of usage based on one 12-hour shift or two 10-hour shifts. To the extent that Colorado River water use exceeds USF&WS protective limits, DOE would mitigate the unavoidable adverse impact with negotiated water depletion payments.

Table 2–22. Estimated Maximum Acres of Disturbed Land for the Off-Site Disposal Alternatives

Location/Activity	Alternative							
	Klondike Flats			Crescent Junction			White Mesa Mill	
	Truck	Rail	Slurry	Truck	Rail	Slurry	Truck	Slurry
Moab Site	439	439	439	439	439	439	439	439
Vicinity Properties ^a	6	6	6	6	6	6	6	6
Borrow Areas								
Cover soils	400	400	400	400	400	400	0 ^b	0 ^b
Moab reclamation soils	152	152	152	152	152	152	152	152
Radon barrier soil	138	138	138	138	138	138	12	12
Other	NA	NA	NA	NA	NA	NA	10 ^c	10 ^c
Pipeline Construction ^d	NA	NA	85	NA	NA	164	NA	430
Disposal Cell Area								
Cell Construction Area ^e	435	420	435	435	420	435	346	346
Overpass/ Haul or Access Roads for Truck Transport	40	NA	24	13	NA	11	2	NA
Rail Infrastructure ^f	NA	69	NA	NA	57	NA	NA	NA
Total	1,610	1,624	1,679	1,583	1,612	1,745	967	1,395

^aAssumes average disturbances of 2,500 ft² to 98 properties.

^bExcavated material would be used as cover soil.

^cBlanding riprap.

^dAssumes disturbance to a 40-foot right-of-way.

^eNew cell footprint and adjacent construction and support areas.

^fNew rail spurs, truck/train transfer station, and haul road to cell.

Table 2–23. Estimated Annual Fuel Consumption for the Off-Site Disposal Alternatives
(thousands of gallons)

Alternative							
Klondike Flats			Crescent Junction			White Mesa Mill	
Truck ^a	Rail ^a	Slurry ^b	Truck ^a	Rail ^a	Slurry ^b	Truck ^a	Slurry ^b
2,336–4,314	2,053–3,232	1,798	2,712–4,873	2,187–3,657	1,798	4,032–6,827	1,469

^aTwo figures indicate annual averages for one 12-hour shift (lower value) and two 10-hour shifts (higher value).

^bFor the slurry pipeline alternative, despite its longer pipeline length, the White Mesa Mill fuel consumption is less than that for Klondike Flats or Crescent Junction because of significantly lower distances for hauling borrow materials at White Mesa Mill. Similarly, Klondike Flats and Crescent Junction consumptions are the same for the slurry pipeline alternative because differences in borrow material haul distances offset the differences in pipeline length for these two alternatives.

Table 2–24. Estimated Annual Nonpotable Water Consumption

Transportation Option	Total Project Water Consumption (acre-feet)	Average Annual Water Consumption (acre-feet)
Rail	635–710	130–235
Truck	700–775	135–240
Slurry Pipeline	3,470	730

Table 2–25 shows the estimated potable water consumption for the three transportation modes for all three off-site disposal location locations. Consumption rates are based on the 12-hour shift and use an average of the labor required for the different transportation options. If the double 10-hour shift were selected, consumption rates would increase by 67 percent but would apply for the shorter construction duration.

Table 2–25. Potable Water Consumption Rates

Transportation Option	Average Daily Water Consumption Rate (gallons)
Rail	7,500
Truck	9,000
Slurry Pipeline	6,600

2.2.7.6 Solid Waste Disposal

Approximately 2,080 yd³ of solid waste per year would be generated at the combined Moab and Klondike Flats, Crescent Junction, or White Mesa Mill sites for the off-site disposal alternatives. The solid waste from the Moab, Klondike Flats, or Crescent Junction sites would be disposed of in the Grand County landfill. The solid waste from the White Mesa Mill site would be disposed of in tailings cells that currently exist at the site or in the new tailings disposal cell constructed for Moab site contaminated materials.

2.2.7.7 Sanitary Waste Disposal

Table 2–26 shows the estimated maximum weekly sanitary waste generation for the three transportation modes for all three off-site disposal locations. The estimated volumes are based on the 12-hour shift and use an average of the labor required for the different transportation options. If the double 10-hour shift were selected, the volume generated weekly would increase by 67 percent but would apply for the shorter construction duration. Septic holding tanks would be placed at both the Moab site and the off-site disposal location; some portable toilets would be used to provide sanitary waste service. Both the septic tanks and the portable toilets would be pumped out routinely, and the waste would be disposed of at the city of Moab sewage treatment plant for the Klondike Flats or Crescent Junction off-site disposal alternatives or at the city of Blanding sewage treatment plant for the White Mesa Mill off-site disposal alternative. White Mesa Mill also has an on-site State-approved leach field system that has adequately managed sanitary waste generated by up to 140 workers during past operations.

Table 2–26. Sanitary Waste Generated

Disposal Option	Maximum Weekly Generation (gallons)
Rail	15,000
Truck	21,000
Slurry Pipeline	15,400

2.2.7.8 Electric Power

Table 2–27 shows DOE’s estimate of the power demands at the Moab site and at the three potential off-site disposal locations for the three transportation modes. In general, the major demands would be:

- Field office trailers.
- Office and parking lot security lighting.
- River pump station (at Moab).
- Decontamination water sprays and recycle pumps.
- Train transfer station (rail transportation).
- Pipeline slurry system (pipeline transportation).

*Table 2–27. Estimated Maximum Average Annual Electric Power Demand (kVA)
For the Off-Site Disposal Alternative*

Transportation Mode	Location			
	Moab Site	Klondike Flats Site	Crescent Junction Site	White Mesa Mill Site
Truck	600	300	300	300
Rail	700	600	600	–
Pipeline	–	2,500 (terminal)	2,800 (terminal)	3,100 (terminal)
To Klondike Flats	3,400			4,800 (booster)
To Crescent Junction	4,800			
To White Mesa Mill	6,100			

2.3 Ground Water at the Moab Site

Section 2.3.1 provides background on the ground water standards, contaminants of concern, and the compliance strategy selection process. This includes remediation goals for the ground water, and the relationship with existing interim actions. Section 2.3.2 discusses the proposed ground water remediation, including remediation options and time frames, and the predicted contaminant concentrations as a result of active remediation. It also discusses the predicted outcome of the ground water No Action alternative. Section 2.3.3 discusses ground water remediation uncertainties.

2.3.1 Background

The uppermost aquifer at the Moab site occurs in unconsolidated Quaternary alluvial material deposited on older bedrock units in the basin that forms Moab Valley. Although the quality of this aquifer has been adversely affected by uranium processing activities at the site, it does not represent a potential source of drinking water. However, discharge of contaminated ground water from this aquifer has resulted in elevated concentrations of ammonia and other site-related constituents in the Colorado River. While the contaminants do not pose unacceptable risk to humans, they do exceed levels considered to be protective of aquatic life. Therefore, the objective of the proposed ground water action is to protect the environment, particularly endangered species of fish that are known to use that portion of the river.